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This paper surveys the topic of human factors in the form of a taxonomy. Human factors are and always have been of vital concern to the military commander, and are essential elements in the way all organizations function.

Military literature does not offer a significant source of study materials for developing professional knowledge and skills in human factors related studies. Civilian literature, however, is available and applicable to the military leader's needs.

The taxonomy, a classification system based on theory underlying the subject, is an especially valuable vehicle for surveying a topic like human factors. The structured development of a subject that is inherent to the taxonomy has several practical and intellectual benefits. The practical aspects include information storage arrangement, curriculum design, and terminology clarification. Intellectual implications recognize that new information is more easily understood and remembered when it fits into a pattern, or informational structure, already established in individual thinking. Also, this structure guides attitudes about the relevance of new material to a given subject

This taxonomy divides human factors into individual, small group, and large group categories as primary divisions. the sub-levels of each address information input, processing, and the attitudina l reactions which result.

A HUMAN FACTORS TAXONOMY

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE

by

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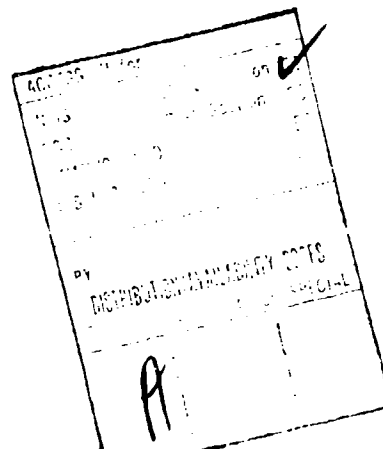
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This paper surveys the topic of human factors in the form of a taxonomy. Human factors are and always have been of vital concern to the military commander, and are essential elements in the functioning of all organizations.

Military literature does not offer significant human factors study materials for developing professional knowledge and applicable skills. Civilian literature, however, is available and applicable to the military leader's needs.

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CHAPTER I

INTRODUCTION

Purpose

The purpose of this paper is to develop a taxonomy of human factors in the military and to demonstrate its practical use.

Definitions

Human factors are those determinants of human behavior that influence job performance; for example, morale, perceptions, learning, and esprit de corps. They result from the combination of personal experiences, social and cultural background, religious and educational training, and the design of the brain and nervous system. Physical attributes such as strength and endurance are not included. Obviously there is a great deal of mutual influence between man's mental and physical performance; however, there is an essential difference between lifting a load and wanting to do so. It is the latter that is addressed in this paper.

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A taxonomy is a classification system, that is a means for organizing material in a systematic arrangement of classes. It is characterized by categories based on principles that underlie the subject matter and by its hierarchical arrangement of classes. The animal kingdom, for example, could be classified according to the size, color, or habitat of its members. In the taxonomy of animal life, however, categories are based on evolutionary lines of development. Thus the Theory of Evolution is the underlying principle and the basis for creation and arrangement of groupings in the study of the animal kingdom. Likewise, an hierarchical arrangement is evident in branches which descent chronologically and depict each unique development in a line of progeny as a next lower subcategory.

Delimitations

The military environment being considered is the current United States Department of Defense. No distinction is made between services since human factors are equally important and basically the same in them all. The term "soldier" is used throughout this paper, unless otherwise stated, as a generic collective to identify all male and female members of the armed forces.

The time frame is limited to the present, therefore no historical perspective will be developed in the taxonomy. Also, factors such as ideology, which are of

direct importance in some foreign military organizations,
but not in our own, will not be directly included.
Ideologies that are part of the U.S. military man's
make-up are derived through social and cultural channels
rather than formal military training. They will
therefore be included only indirectly as part of this
study.

It is not within the scope of this paper to
develop the theoretical topics used in the taxonomy.
Only brief statements describing the primary notion of
each theory will be given, along with concise statements
to describe each category and establish relationships
among them. The rationale and methodology of building
the taxonomy will be developed in Chapter IV.

Taxonomy Applications

The many theoretical implications of the taxonomy
will be examined in Chapter III. It is appropriate as
an introduction, however, to mention some practical
applications. The most obvious is in the arrangement of
stored subject matter in a systematic manner for easy
retrieval. This is the purpose of the Dewey Decimal
System for books, Roget's Thesaurus for words, and an
office filing system for letters.

In an academic sense, the taxonomy may be used
as an aid in designing a class or course curriculum

dealing with human factors. It can help clarify relationships among individual subjects, and be used as a cross check against a more standard functional arrangement of material to insure that no important information has been neglected.

Finally, the taxonomy can be an aid to communication. Ambiguities can be resolved and relationships among terms better understood through reference to a taxonomy.

Importance of Human Factors

The human aspects of war and military life are important beyond overstatement. War is a human event; no plan, action, or machine of war can exist without first having been conceived or created by man. None can function without his direction. Sun Tzu, writing in the sixth century B.C., listed "moral influence" as the first of his five fundamental factors of war.[1] Although much has changed socially and technically in the past 25 centuries, the significance of human factors has not diminished. Many authors, in fact, hold them to be more vital now than ever before.[2]

The socially sophisticated and highly educated soldier of today cannot be led effectively without the knowledgeable application of principles studied in the Behavioral Sciences. In "free world" military establishments he will not, for example, submit to strongly

authoritarian leadership, but must be influenced to do his best through understanding of his needs and motivations.[3]

Technology, while appearing to replace men with machines, has in fact put greater reliance on individual and small group performance in operating machines effectively.[4] By any measure, the human side of war is a timely subject worthy of study.

1. S.B. Griffith, <u>Sun Tzu - The Art of War</u> (New York and Oxford: Oxford University Press, 1963), p. 63.

2. Morris Janowitz and Roger W. Little, <u>Sociology and the Military Establishment</u> (New York: Russell SAGE Foundation, 1965), p. 42.

3. Ibid., p. 437.

4. Ibid., p. 42.

Chapter II

HUMAN FACTORS IN THE MILITARY

"I call high morale the greatest
single factor in war."

Field Marshal Bernard Montgomery

While the previous chapter presented an overview
of the entire paper, this one will establish the
historical and continuing importance of human factors in
the military. Sources of information about human factors
in military and civilian literature, and their relevance
to the military environment, will be discussed.

Historical Importance

There can be no doubt of the vital role played by
human factors in the military environment. Personal
qualities that characterize the professional soldier such
as courage, willpower, purpose and innovativeness all
result from human qualities. Writing in 500 B.C., Sun
Tzu stressed the importance of controlling the mental
attitudes of both friendly and enemy troops to secure
victory in war.[1] The mid-fifteenth century Synodal Code
of the Russian Tsar Alexey Mikhaylovich contained

instructions on the mental states of armed men and how to
direct them in the service.[2] Knowing and influencing
the mood and temper of military men has long been a
primary concern of commanders.

Lieutenant Colonel P.L. MacDougall, Superintendent
of Studies at the Royal Military College, England, in
the mid 1800's, quoted Napoleon extensively in his book,
The Theory of War.[3]

> The divine part of the art (of war) is that
> which is derived from moral considerations of the
> character, talent and interests of your adversary;
> of the opinion and spirit of the soldier, who is
> strong and victorious, or feable and vanquished,
> according as he believes himself to be.

In a chapter entitled, "On Moral Agents in War,"
MacDougall quotes the great battle captain further as
saying, "in war 'the moral' is to 'the physical' in the
ratio of three to one." In other chapters MacDougall
discusses personal qualities of commanders and ways to
influence men.

Current Importance of Human Factors

Although technology has greatly altered the
complexion of the battlefield, the essential humanness
of wartime events remains. S.L.A. Marshall, retired
Brigadier General, military historian, and student of
combat in WWII and Korea wrote, "Only when the human,
rather than the material aspects of an operation are put
uppermost can tactical bodies be conditioned to make the

most of their potential unity."[4] In The Yom Kippur War,
A.J. Barker summed up the importance of human factors
vis a vis technology in that 1973 conflict by stating,
"All these (new) weapons were to have a tremendous impact
on the war - the extent of which has been assessed and
will be reassessed time and again. But in the Middle East
the human element proved to be as important as it ever
was."[5]

Doctrinal writings of both the United States and
Soviet armies support the importance of human factors in
modern war. US Army Field Manual 30-40, Handbook on
Soviet Ground Forces, Para 3-1, quotes a statement of
Soviet military policy, "It is not equipment alone, no
matter how advanced it is, but man capable of using it to
the fullest extent, man distinguished for his high morale,
that will secure victory in war." From material issued
at the US Army Command and General Staff College, "Combat
power is a combination of the physical means available to
a commander and the moral strength of his command."[6]

Study Material Sources in the Military

With human factors widely accepted as an important
aspect of the military environment, a question arises as to
sources of relevant information available to the
professional soldier and its applicability to the military
environment. The armed forces have done considerable work
in human engineering and psychological testing.

Psychophysiology has received a great deal of attention in support of the space program and psychiatry in the military environment, especially combat, has been studied.[7]

All of these efforts have made valuable contributions in their respective areas, but they are written in highly technical language by and for scholars and specialists. Lay readers cannot readily understand or apply this material to their work. Also, such material tends to be peripheral to the line officer's needs.[8] Subjects like institutional training, testing and evaluation, and man-machine interface design are explored in depth, while the basic business of improving under- standing, communications and interpersonal relationships among the troops has received little attention in the military writings. As a result, no significant pool of military literature exists to use in the study of human factors.[9]

Study Material Sources From Civilian Literature

Military men tend to assert that civilian studies in applied psychology, and the management techniques based on them, are of no value in the military environment. This attitude probably stems from two conditions. First, the theoretical and obscure language and ideas developed by Sigmund Freud and others early in the study of human behavior were of little direct or practical use.

Opinions formed on the basis of these writings would naturally be skeptical. Second, many people believe that violence in the combat environment precludes rational behavior; therefore excluding the battleground from a rational investigation. Each of these views, however, is being increasingly contradicted by a growing number of studies and an increasing volume of literature which support the notion that civilian studies can and should be used; and that human behavior, including that in combat, can and should be studied by military people.

On the question of readability and utility, a kind of everyday psychology has developed in behavioral science and organizational theory literature that is readily studied and used by laymen. For example, T.A. Harris' book, I'm OK - You're OK, is a popular version of Dr. Eric Berne's theory of Transactional Analysis.[10] Harris' book was on The New York Time's best seller list for over a year. Hundreds of books now on the market are written for managers to apply in their work, rather than for specialists to use in their practices. For example, Ernest Dale's, Management: Theory and Practice, features four chapters on applying Behavioral Science to management processes, plus others on organizational theory, decision making, and planning based on the behavioral scientist's perspective.[11] The Personnel Management Process, by Wendall French, also features several chapters of behavioral science topics

applied to management.[12]

Another trend that makes current literature more useable for the layman is that much of the modern theoretical writing is in the form of easily understood models. Complex factors that influence human behavior are condensed into concepts which can be understood and used by laymen. For example, Maslow's hierarchical need level model[13] is a tool useful even to the high school level reader for a better understanding of himself and those around him.

Human Factors Study in the Military

Not only are writings in the psychological and behavioral science fields becoming more practical and readable, but there is mounting evidence that military people can and should apply these lessons toward the enhancement of their duties.

The Soviet book, "Military Psychology - A Soviet View," for example, develops every aspect of the soldier's life and work as a suitable topic for scientific study.[14] In the introduction to the book, the USSR Minister of Defense, Marshal of the Soviet Union A.A. Grechko, is quoted as saying that all officers should study psychology to become better leaders. A U.S. Air Force study in 1966 concluded that the Herzberg model of job satisfaction factors applies equally well to military members and to civilians.[15] Captain C.O. Halverson reached the same

conclusion in his 1974 Command and General Staff College thesis, <u>Motivation</u> <u>and</u> <u>Job</u> <u>Satisfaction</u> <u>for</u> <u>Middle</u> <u>Level</u> <u>Career</u> <u>Army</u> <u>Officers</u>.[16]

In his Master's thesis, <u>A</u> <u>Comparative</u> <u>Analysis</u> <u>of</u> <u>Job</u> <u>Satisfaction</u> <u>in</u> <u>Air</u> <u>Force</u> <u>and</u> <u>Civilian</u> <u>Management</u>, at Louisiana Tech University, Philip M. Berg used the Herzberg model as the basis for comparing 751 civilian to 430 Air Force managers. Although there were some variations in the profiles developed of the two groups, the obvious premise of the work is that the model selected applies to them both.[17]

Another study, published in the "Journal of Applied Psychology", by P.V. Johnson and R.H. Marcum of Purdue University, applied the Maslow need level model to three echelons of Army officers for the purpose of developing a need fulfillment profile.[18] Their work describes a clear variation in the potential for need fulfillment among pay grades and between staff and command positions.

Some topics, developed in civilian literature, apply directly to the combat environment. Dr. M.D. Meerloo, for example, has discussed the psychological and physiological characteristics of shock.[19] He has noted that surgical and combat shock are both caused by fear and panic, and that knowledge and training can do a lot to reduce the likelihood and severity of these phenomena. Dr. Von Greyez, in <u>Psychology</u> <u>of</u> <u>Survival</u>, has examined the trauma of nuclear war and concluded that prior

knowledge and training are the principal means of control-
ling panic, shock and loss of control.[20] In his article,
"Buddy Relations and Combat Performance," Roger Little
looks specifically at social roles in combat situations.[21]
It is hardly surprising that he found relationships on the
battlefield do not become irrelevant, but rather grow more
intense and become more important to job performance there.

Management Study and the Military

Management methods based on the behavioral
sciences are seen by many military people as being too
"soft" for application in the potentially life-and-death
military environment. This attitude stems largely from
two common misunderstandings. First, an assumption is
made that a single management method or style is
prescribed for all situations. Actually, the most widely
read authors develop models which cover a range of leader-
ship styles. These vary from unstructured, group centered
approaches to sternly autocratic methods. The Hersey-
Blanchard model, for example, includes an analysis of the
people and organizational circumstance as a specific step
in the process of selecting an appropriate leadership
style.[22] The knowledge and application of a range of
approaches provides a bag of tools which can benefit all
military leaders.

A <u>second</u> reason that management techniques are frequently believed not to be applicable in the military is based on the premise that only methods suitable for combat can be used. This notion rings with "macho," but is clearly not realistic because of the vast majority of all military activities are performed in non-combat environments. Even during a major conflict, like Vietnam, the preponderance of all military man hours each day are not spent fighting. Units and crews that do fight or work in other hazardous conditions can adjust their behavior patterns as necessary while not actually doing so. For example, the role of flight lead in a fighter formation requires an extremely autocratic style of leadership, contrasting sharply with the casual atmosphere of the same group during non-flying activities. The necessary adjustments in interpersonal relationships are made in accordance with differing circumstances.

The strongest case for the applicability of modern management approaches to the military can be made by observing that both the Army and the Air Force are now conducting internal management consultant programs styled after civilian program models. The Army is training Organizational Effectiveness Staff Officers for assignment into installation and operating organizations to function as a consultant for commanders and to help with organizational problems.

1. S.B. Griffith, <u>Sun Tzu - The Art of War</u> (New York and Oxford: Oxford University Press, 1963), p. 41

2. V.V. Shelyag, A.D. Glotochkin, K.K. Platonov (eds), <u>Military Psychology - A Soviet View</u> (Moscow: Military Publishing House of the Ministry of Defense of the USSR, 1972), p. 27.

3. P.L. MacDougall, <u>The Theory of War</u> (London: Longman, Brown, Green, Longmans, and Roberts, 1858), p. 43.

4. S.L.A. Marshall, <u>Men Against Fire</u> (New York, Washington: Combat Forces Press and William Morrow & Co., 1947), p. 59.

5. A.J. Barker, <u>The Yom Kippur War</u> (New York: Random House, Ballantine Books, 1974), p. 115.

6. Lesson M3161-6, Appendix I, para. 3a USACGSC, 1975.

7. N.D.C. Lewis, B. Engle (eds.), <u>Wartime Psychiatry</u> (New York: Oxford University Press, 1954), 950 pp.

8. Morris Janowitz, Roger W. Little, <u>Sociology and the Military Establishment</u> (New York: Russell SAGE Foundation, 1965), p. 121.

9. New manuals such as FM 22-100, <u>Military Leadership</u>, June 1973 are beginning to fill this void.

10. Thomas A. Harris, M.D., <u>I'm OK - You're OK</u> (New York: Avon Books, 1973), 304 pp.

11. Ernest Dale, <u>Management: Theory and Practice</u> (New York: McGraw-Hill Book Company, 1965), 771 pp.

12. Wendell French, <u>The Personnel Management Process</u> (Boston: Houghton Mifflin Company, 1974), 741 pp.

13. Abraham H. Maslow, <u>Motivation and Personality</u> (New York: Harper and Row Publishers, 1954).

14. Shelyag, op. cit.

15. C.O. Halverson, "Motivation and Job Satisfaction for Middle Level Career Army Officers" (unpublished Master's Thesis, CGSC, 1975), p. 31, citing Air Force Study (Department of the Air Force, Office of the Chief of Staff, <u>A Study in Officer Motivation: New View</u>, Washington: Government Printing Office, 1966, p. 118).

16. Ibid.

17. Philip M. Berg, "A Comparative Analysis of Job Satisfaction in Air Force and Civilian Management" (Ruston, Louisiana, an unpublished research paper at the Louisiana Tech University, 1971).

18. Paul V. Johnson, Robert H. Marcum, "Perceived Deficiencies in Individual Need Fulfillment of Career Army Officers," Journal of Applied Psychology, 1968, p. 457.

19. M.D. Meerloo, Patterns of Shock (New York: International Universities Press, Inc., 1950), 150 pp.

20. Von Greyez, Psychology of Survival (Amsterdam, New York: Elsevier Publishing Co., 1962), 150 pp.

21. Roger Little, "Buddy Relations and Combat Performance,' The New Military - Changing Patterns of Organization, .d. Moris Janowitz (New York: SAGE Foundation, 1964), p. 195.

22. Paul Hersey, K.H. Blanchard, Management of Organizational Behavior (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972), p. 133.

CHAPTER III

THE TAXONOMY

What Is A Taxonomy

As explained in Chapter I, this study will develop a taxonomy of human factors in the military environmei Human factors study was discussed in Chapter II, and it is the purpose of this chapter to explore the nature, history, and importance of the taxonomy.

The word, "taxonomy," means a classification system based on theory underlying the subject matter. Classical examples of taxonomies are the classification systems for plants and animals. The groupings of phylum, class, order, family, genus and species not only serve to organize and structure the subject matter but clearly demonstrate the underlying Theory of Evolution.

Classification Systems

A "taxonomy" as defined in the preceding section is a classification system. It is therefore appropriate here to reflect on the nature, uses and importance of such systems.

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A classification system is a set of rules for arranging things or ideas into an orderly array of groupings. All members of each group have some mutual property not shared by members of any other group. Thus each group can be designated, characterized and located by its nominal property.

In the most general sense, classification schemes serve to conveniently organize material for systematic storage and easy retrieval. Thus hardware contained in bins is sorted by size and shape; correspondence is filed in alphabetical order. This was Melvil Dewey's intent when, as a student library assistant, he devised a radical new means of classifying and arranging books in the library. Before his contribution, books were customarily arranged by alphabetical order, size, color or accession.[1] It is not that Dewey invented the notion of classification, or even first applied it to books in the library. Indeed, books systematically arranged by color are, in fact, classified. The obvious shortcoming, however, is the lack of correlation between color and subject matter.

From the practical standpoint, Dewey's contribution was the selection of nominal groupings to designate, characterize and locate each category of book by our primary interest in them, subject matter. A more fundamental improvement, however, was the elevation of focus from size and color - physical properties - to informational content - an intellectual quality - as the

discriminating factor. The significance of this latter point is profound, and will be further developed in subsequent sections.

Classification and Structure

The property that facilitates storage and retrieval when material has been classified is __structure__: that is, __relative__ __position__ of each informational element. Relativeness connotes positions that exist in a framework defined by the relationships among them. On a number line, for example, one would expect to find "four" between "three" and "five." This is, in fact, how the structure of a number line may be defined.

The structure of a classification system is frequently reflected in physical locations. For example, books shelved in a library, word symbols in a dictionary, and magnetic pulses in a computer memory bank may be positioned in accordance with such a system. These arrangements provide a means of physically locating the desired information and insuring its proximity to other relevant material. This function is very important, but not fundamentally so. The more basic value of structure is in the mental processes which result from structure imposed on information. "Attending" and "relating" are two processes directly influenced by informational structure.

The attention of an observer is directed into preconceived categories by structure. That which is included in or near the category of interest is treated as relevant, while excluded material is frequently ignored. This process is good and necessary from a practical standpoint. One would not, for example, want to plow through ancient history while researching modern aviation. On the other hand, limitations imposed while using categories should be borne in mind. Consider, for instance, how differently an armor officer views the battlefield than does an artilleryman. When they entered the service their perceptions may have been quite similar, but as their professional development is moulded according to the personnel classification system they come to hold quite different points of view.

Major academic disciplines were separated over the years into discrete schools for study. Some of these categories were defined rather arbitrarily, for convenience at various universities. These divisions caused the development of separate points of view, and even different jargons, in dealing with the same topics. Some of the greatest academic and scientific achievements of recent years have resulted from the synthesis of ideas found in schools previously isolated from each other by the classification system. Biochemistry, Biophysics, Psychosociology, and Neuropsychology are all modern terms that reflect this trend. The clear implication is that

an arbitrary separation of information may well have
delayed the necessary synthesis, and that if some other
means of classification had been applied the separation
may not have occurred and progress could have been made
much faster.

The Structure of Intellect

Philosophers have long inquired into the structure
of knowledge and its relationship to thinking.[2] Aristotle,
Bacon, and Locke, among others, classified all knowledge
as they understood it. Conventional wisdom subconsciously
displayed in our language today implies the importance of
the structure of knowledge with such phrases as "frame of
reference." There is clearly more involved in this notion
than a "point of view," since a structured mental frame-
work from within which one views the world is clearly
implied. Although not yet empirically demonstrable,
the existance of a mental or intellectual structure is
the central theme of work going on in several areas.

Following the lead of Thurstone in the 1930's,
and the Air Force psychologists of WW II, J.P. Guilford
is developing a structural model of the intellect.[3] His
premise is that intellectual processes fall into
detectable and identifiable categories, in much the same
way that we divide problem solving into processes of
identifying, defining, developing alternatives, and so
forth. The categories in his model are interrelated in

predictable patterns which he represents in a three-dimensional matrix. Guilford has identified five operations (cognition, memory, divergent production, convergent production, and evaluation) which are performed on four types of content (figural, symbolic, semantic, and behavioral). The results of these interactions are six products (units, classes, relations, systems, transformations and implications.) His matrix is now being used to predict the characteristics of some 35 factors which have not yet been detected. When found, these factors will fill in the blank cells of the model. There is a strong resemblance between the approach taken by Guilford and that taken by Mendeleev in the development and use of the Periodic Table of the Elements. The Periodic Table is, of course, a two dimensional matrix which led to the discovery of many elements after their characteristics had been predicted as those needed to fill blank positions in the table.

Remembering is the mental process that is most clearly demonstrated as being structured. It is both understood and accomplished best as a process of establishing the relative position of each new bit of information within an existing file. In his book, Remembering Made Easy, Arthur L. Logan suggests several aids for remembering names, objects, numbers and events.[4] In each case the key in his method is to firmly establish a connection between the thought to be remembered and some pre-memorized list,

or a link from one item to the next in a new list. It is the "memory trail", or interconnecting pathway among thoughts, that one follows in remembering.[5] The very strong evidence in support of this view led J.R. Anderson and G.H. Bower to define learning in terms of building associations between new information and that already known.[6] With the definition of structure, as given in a previous section of this paper, the implication is that all learning and remembering, that is all non-inherited mental content, is in the form of an informational structure.

At this point it is appropriate to inquire briefly into a possible cause for structure being apparently such an integral part of mental activities.

Intellectual Structure and the Brain

Study and experimentation in neural physiology are rapidly developing a picture of how the brain and nervous system work, and may ultimately provide the reason for what appears to be a structural basis for all mental activity. From the study of the eye's retina, a true neural extension of the brain, it has been learned that nerve cells act to reinforce or inhibit the responses of adjacent cells, depending on the pattern and movement of the visual image.[7] Such functional interrelationships between cells are established by the neural wiring schema which joins them, literally, just as radio

components are joined by electrical conductors. In addition to sensing an image, the reinforcement/inhibition patterns actually discriminate in favor of certain types of images. This discrimination phenomenon constitutes a preliminary decision which directs attention to the selected objects.

Nodes, clusters, and cells of the brain are similarly interconnected with reinforcement and inhibitory circuits. In the brain, however, learned behavior and memory exist in the form of selectively created neural circuits. These circuits are created as a response to informational inputs. It is clearly the structure of these circuits, as determined by perceived relationships among informational elements, that dictates the performance of the brain.[8] The "memory trails" mentioned in the previous section become, quite literally, electrochemical pathways which, when followed, trigger a series of complex patterns of neural responses that may only be arrived at by following the appropriate path. The true genius of Freud was to infer that all mental processes occur in such an inter-related and structured media.

Although this discussion has digressed somewhat from the primary topic, the excursion was short and necessary to put the notion of structure, therefore classification and, ultimately, the taxonomy in its proper "frame of reference."

1. Melvil Dewey, <u>Decimal Classification</u> (New York: Forest Press Inc., 1951), p. ix.

2. Ibid., p. ix.

3. Donald W. Taylor, "Thinking," <u>Theories in Contemporary Psychology</u>, ed. Melvin H. Marx (London: The MacMillan Company, 1963), pp. 475 - 480.

4. Arthur L. Logan, <u>Remembering Made Easy</u> (New York: ARC Books Inc., 1955), 94 pp.

5. John R. Anderson, Gordon H. Bower, <u>Human Associative Memory</u> (Washington D.C.: Hemisphere Publishing Corp., 1974), pp. 355-388.

6. Ibid.

7. Jorg Peter Ewert, "The Neural Bases of Visually Guided Behavior," <u>Scientific American</u>, March 1974, p. 104.

8. Lennart Heimer, "Pathways in the Brain," <u>Scientific American</u>, July 1971, p. 48.

CHAPTER IV

METHODOLOGY

Research Method

Library search provided the primary source of
material for developing the taxonomy. Books on psychology,
sociology, management, physiology and related topics were
scanned to generate topical lists. This methodology is
similar to that used by Bloom and his committee in
developing their taxonomy of educational objectives.[1]

Sorting the lists into tentative arrays led to
the choice of an arrangement which best fit guidelines
described in the following section. Further development
of the trial arrangement resulted in the taxonomy
presented in Chapter V.

The thesis advisory committee met with the author
during the formulative stages of this paper for review and
discussion to insure that terms selected communicated the
same meanings to all readers. This was an important step
in view of the communications role intended for the
completed taxonomy.[2]

General Guidelines

The following guidelines were developed for the process of building a taxonomy. They are the practical rules necessary to supplement the theory discussed in Chapter III. The guidelines used in this paper parallel, for the most part, those used in the Taxonomy of Educational Objectives.[3] They serve to reduce the ambiguities in developing the taxonomy, and to insure its utility.

First, the taxonomy must be logically developed and internally consistent. A given word or phrase, for example, must retain the same meaning throughout. Also, relationships implied by a term's position in the array must be supported by any definitions or discussions of the terms involved.

Second, the array configuration and term discussions must conform to current understanding of psychological phenomena. This requirement can be satisfied by referring to current literature. The relationships among concepts, however, are not so easily determined. Writers tend to develop their topics on human behavior as though an entire picture were being presented. However, as E.R. Hilgard observed of learning theory,[4] and as Paul Hersey and Kenneth Blanchard demonstrated with organizational theory,[5] the best picture results from fitting together the many small pieces that individual theories offer. This piecing

together can be done either as an over-arching theory,
as is the Hersey-Blanchard model, or in the form of
taxonomy, as done by Bloom et al. Since writers do not
usually discuss the interrelationships between their own
theories and those of others in the field, it is
incumbent on the observer to infer them.

Third, the terms used in the taxonomy must be
neutral and descriptive. They should imply no value
judgements as to a superiority of one notion over others.
Also, the language and structure must allow future entires
on the subject without bias or prejudice.

Fourth, and finally, definitions and relationships
expressed in the taxonomy should reflect common usage.
Since one of the primary benefits of a taxonomy is to aid
in communications, it is essential that a general under-
standing on the subject not be violated. This rule is,
however, subordinate to the previous three.

The Larger Context

The delimitations section of Chapter I addressed
some of the "boundaries" of this paper in terms of scope
and depth. This section will discuss the boundary subject
areas showing how human factors in the military environ-
ment fit into the larger context.

The military can be subdivided many ways, but
functional subdivisions are probably the most often used.
An excellent example is Forrest K. Kleinman's The Modern

United States Army.[6] With a focus on the soldier,
Lt. Col. Kleinman describes the Army in terms of training,
equipping, organizing, deploying, supporting, supplying,
and administering. Functional divisions are also typical-
ly applied to regulations, manuals and organizational
materials as a matter of practical necessity. This type
of categorization, however, does not satisfy the require-
ments of a taxonomy; that is, the subdivision structure
is not normally based on underlying principles.

For the purpose of establishing a position of
human factors in the military and the larger scheme of
things, manpower, a subdivision of the military, is
divided into 1) Physical Attributes and 2) Human Factors.
The military, in turn, is divided into 1) Materiel,
2) Manpower, and 3) Doctrine. The next higher level,
of which the military is one division, is National Means
For International Influence. The members of this
category are 1) Geographic, 2) Cultural, 3) Economic,
4) Military, and 5) Political means.

The above categories were selected because they
are in popular use and are built upon clearly distinct
theoretical bases. These criteria are in accordance with
the rules established in the previous section, the theory
developed in Chapter III, and the rationale that is
discussed in the following section.

A TAXONOMY OF NATIONAL MEANS

FOR INTERNATIONAL INFLUENCE

100 Geographic

200 Cultural

300 Economic

400 Military

  410 Materiel

    11 Supplies
    12 Equipment
    13 Facilities

  420 Manpower

    21 Physical Attributes
    22 Human Factors

  430 Doctrine

    31 Organizational
    32 Operational

500 Political

Rationale For The Taxonomy

A taxonomy, as applied to the animal kingdom, is
a symbolic reproduction of the subject. Conceptual
relationships between word symbols on paper exactly mirror
physical relationships among the objects represented.
This pure application of taxonomy theory is possible only
where, 1) a physical structure or system does in fact
exist, and 2) where a single theoretical structure
embraces the entire subject as the theory of evolution
does in the case of living things. For subjects comprised
of many contributing theories but lacking a single
overarching structure, like educational objectives, a
less rigorous approach has been used: inferred conceptual
groupings.

An example of how conceptual groupings may be
accomplished can be demonstrated using the square, circle,
cube, and sphere. One may pair together the square and
cube, then the circle and sphere. This arrangement can
be viewed as categories embodying the concepts of
"roundness" and "squareness." Another possibility is to
pair the square and circle, then the cube and sphere.
This array demonstrates "two dimensions" as opposed to
"three dimensions." Since the theoretical development of
geometry reflects the dimensional concepts, the latter
choice of pairings would be made in preference to the more
philosophical choice first mentioned.

Two additional distinctions should be made here between the natural and conceptual taxonomies. First, while only one possible arrangement can represent the physical and historical facts describing the subject of a natural taxonomy, there are many possible approaches to arranging a broad theoretical subject. The taxonomy presented in this paper, for example, is not a unique solution but only one of many possib'e means for accomplishing the task. Second, the natural taxonomy proceeds, by inherent properties of its subject, from the relatively simple to the more complex. This hierarchical characteristic must be artificially adopted in the conceptual taxonomy as a convention of arrangement.[7]

Although the study of human behavior transcends many disciplines, a common distinction to them all is the number of individuals being considered at a time. Thus a single person is studied differently than are a few, or many. These distinctions are seen as fundamental to the study of human factors, and were selected as the first level of division in the taxonomy. The selection can be defended by observing similar divisions of relevant disciplines: physiology and psychology for individual study, behavioral science (especially group dynamics) for small groups, and sociology and organizational theory for large groups. These are not arbitrary categories, but represent fundamental differences in now humanness is perceived, expressed, and acts to affect the course of events.

At the next lower level in the taxonomy all three of the categories mentioned above are divided into three sub-categories. <u>First</u> is the mechanism used in relating to the outside world. For the individual this includes the senses, nervous system, and the brain. For groups the mechanism takes the form of relationships among individuals accommodating communication and mutual influence. This is the machinery for acquiring information and making it available for processing.

The <u>second</u> subdivision is the processing that occurs after information is acquired. This is the process, as opposed to the mechanism, for internally reacting to information. For the individual this includes learning, remembering, decision making, creative thinking, and the like. In groups this is the interaction among members as they perform these same processes in a coordinated effort.

<u>Third</u> are the constructs that explain inclinations or tendencies resulting from accumulated information and mental habit patterns. Attitudes, behavioral dispositions, and group spirit fall into this category. These are the sources of behavior that cannot be explained by a surface examination of the situation and information at hand: the hero's fount and the coward's abyss. Morale and esprit de corps are in this category.

1. Benjamin S. Bloom (ed.), <u>Taxonomy of Educational Objectives</u> (New York: David McKay Company, Inc., 1956), p. 15.

2. It is significant that the major problem encountered on terminology by the committee was the discriptor used for the group equivalent to morale. The lack of development of this topic in the theoretical literature is discussed under Conclusions in Chapter VI.

3. Ibid., p. 13.

4. E.R. Hilgard, <u>Theories of Learning</u> (New York: Appleton-Century-Crofts, 1948), p. 53.

5. Paul Hersey, Kenneth Blanchard, <u>Management of Organizational Behavior</u> (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1969), p. 173.

6. Forrest K. Kleinman, Robert S. Horowitz, <u>The Modern United States Army</u> (Princeton, New Jersey: D. Van Nostrand Co., Inc., 1964), 208 pp.

7. Bloom, op. cit., p. 18.

CHAPTER V

THE HUMAN FACTORS TAXONOMY

This chapter presents the taxonomy along with the
abstract of the paper. The purpose for this arrangement
is to allow Chapter V to stand alone if extracted for
reference purposes. Additionally, a condensed version of
the taxonomy is presented following the abstract. The
condensed version is provided to orient the reader and to
avoid confusion in the detailed taxonomy by structuring
a model frame of reference.

The Abstract

This paper surveys the topic of human factors in
the form of a taxonomy. Human factors are and always have
been of vital concern to the military commander, and are
essential elements in the functioning of all organizations.

Military literature does not offer significant
human factors study materials for developing professional
knowledge and applicable skills. Civilian literature,
however, is available and applicable to the military
leader's needs.

The taxonomy, a classification system based on the
theory underlying the subject, is a valuable tool for

surveying human factors. The structured development inherent to a taxonomy has several practical and intellectual benefits. The practical aspects include information storage arrangement, curriculum design, and terminology clarification. Intellectual implications recognize that new information is more easily understood and remembered when it fits into a pattern, or informational structure, already established in individual thinking. Also, this structure guides attitudes about the relevance of new material to a given subject.

This taxonomy divides human factors into individual, small group, and large group categories as primary divisions. The sub-levels of each address information input, processing, and the attitudinal reactions which result.

Condensed Version Taxonomy

To provide a quick reference for orientation while reading the full version, the following condensed taxonomy is presented.

```
1.000   The Individual
  1.100   Psychophysiological Factors
  1.200   Information Processing
  1.300   Attitudinal Disposition (Morale)

2.000   The Small Group
  2.100   Processes and Roles
  2.200   Information Processing
  2.300   Attitudinal Disposition (Esprit de Corps)[1]
```

3.000 The Large Group
  3.100 Organizational Theory
  3.200 Information Processing
  3.300 Attitudinal Disposition (Esprit de Corps)

1.000 The Individual

The basic unit of all human activity is the individual.
At this level too, begins the study of human activity
and characteristics.

1.100 Psychophysiological Factors

The external world exists, for the individual, as
complex patterns of neural activities: current and
remembered. What the world can consist of for him,
and how he can respond to it, is determined by the
design and capabilities of the brain and nervous
system.

1.110 Sensory Parameters

These are the limiting values beyond which
receptors cannot detect inputs.

.111 Threshold - Minimum perceivable intensity

.112 Response Spectrum - Range over which the
receptor is sensitive (e.g. color from violet
to red, tonal range from 20 to 20,000 cps).

.113 Discrimination - The distinguishing among or
separating of nearly similar or coincident
sensory inputs.

.114 Habituation - Reduced perceived input strength
due to prolonged or repeated input without
variation.

1.120 Sensory Degradation

A reduction in sensory effectiveness due to
conditions imposed on the nervous system.

.121 Fatigue - General physical weariness brought
on by long hours and exertion; generally dulls
senses and reduces responsiveness.

.122 Stress - The psychological strain and
agitation brought on by perceived circum-
stances.

.123 Sensory Overload - Inputs carrying too much
information at too rapid a pace; processing
lags behind and perceptions become confused.

.124 Sensory Conflict - Inputs from one cr more
receptor source come into conflict;
perceptions can become confused unless one
input is selected for exclusive attention.

1.130 Input Interpretation

Receptor signals arrive to the brain in the form
of neural pulses. How they are decoded and
integrated with all others is the interpretation
process.

.131 Recognition - the process of locating among
remembered neural activity patterns one that
is similar to that currently being
experienced.

.1311 Experience - A cumulative backlog of
remembered neural activity patterns.

1.131   Input Interpretation, Recognition (Continued)

.1312   Logical Organization - Sorting inputs into contextual patterns to achieve a similarity with those remembered.

.132   Multisensory Synthesis - The process of piecing together a complete picture of the immediate world by integrating inputs from the several sources available.

1.200   Information Processing

Groups of neural patterns that have been integrated, interpreted and sorted as to content comprise information. It is the processed results of raw data inputs from receptors: the ideas and notions, one level of abstraction above neural experiences, that make up our thought processes.

1.210   Input Modes

Information arrives in the form of a directly observed event or as symbolic representation.

.211   Direct Observation - The combination of all information inputs relating to the immediate environment as it is being physically sensed.

.212   Symbology - All non-real time experiences and abstract ideas are input symbolically.

.2121   Non-language - Informationally signifi-cant events or circumstances that do not fall in the language category.

211   After event circumstances
212   Pictures

1.2121   Input Modes, Symbology, Non-Language
         (Continued)

    213   Non-word symbols
    214   Gestures and body language
    215   Implications and insinuations

.2122   Language - an organized body of symbols

used according to mutually understood

rules of syntax to communicate infor-

mation.

    221   Hand signs and signals using alphabet
    222   Written words
    223   Spoken words including inflection

1.220   Storage

The retention of neural patterns.

.221   Learning - The process of placing new

information into accessible storage.

.2211   Conditioned Learning[2] - Learning by

repetition encouraged by rewards.

.2212   Associative Learning[3] - Learning by

step-wise association of new to

previously stored information.

.222   Memory - The preservation and recall of

neural experiences (includes forgetting).

.2221   Nativism[4] - Inborn information.

.2222   Reconstruction Theory[5] - Mental process

is duplicated on cue as a picture

flashing on.

.2223   Associative Theory[6] - Residual traces

of past mental processes are located by

tracing hierarchical connections.

1.222 <u>Storage</u>, Memory (Continued)

    .2224 Gestalt Theory[7] - All memories are stored as slight tissue modifications which are cumulative and more meaningful then the sum of the individual changes.

1.230 <u>Manipulation</u>

After being interpreted and processed into information, virtually all mental experiences are further treated, by the processes outlined below, at the idea level of abstraction. This is where the power of the human brain is exercised.

    .231 Conservation or Transmission - The conversion of input information into another form for output without changing content.

    .232 Reduction - The selection of a portion of the information at hand for further consideration.

        .2321 Flagging - Designating items for attention

        .2322 Summarizing - Reducing amount while conserving the most important parts.

    .233 Elaboration - The process of using information in combination with other knowledge, habits, and skills to produce a result.

        .2331 Idea Synthesis - Combining notions.

        .2332 Decision Making - Resolving conflict between notions.

1.233 <u>Manipulation</u>, Elaboration (Continued)

.2334 Creative Thinking - Bringing out

ideas that were previously unknown,

by synthesis.

1.240 <u>Output Modes</u>

All human informational output requires physical

action and is inherently symbolic. Action

taken to affect a change in the physical

environmental circumstance would belong in the

Manpower Taxonomy, not in this study.

.241 Demonstration - Performance of an act to

communicate by the implication of movements

or their results.

.242 Symbology (See 1.212)

.2421 Non-language (See 1.2121)

.2422 Language (See 1.2122)

1.300 <u>Attitudinal Disposition (Morale</u>)

Complex cumulative networks of internalized infor-

mation and mental habit patterns that determine

outlook, attitude, and mood. The constructs used

to explain the phenomenon "morale" are deduced

from observation of human behavior.

1.310 <u>Stress (Psychological</u>)

A disabling perception of pressure, whether

cognitive or subconscious, that results from

conflict between or among simultaneous mental

processes.

1.310   Stress (Psychological) (Continued)

  .311   Anxiety - The result of perceiving an inability to cope with threat.

  .312   Frustration - The result of perceiving a blockage to need fulfillment.

1.320   Motivation

An internal urge or impetus that drives all behavior. Motivation is understood to have dimensions of strength and direction. It arises from both psychological and physiological origins.

  .321   Incentive - An external circumstance that is perceived as a means for need fulfillment (reward).

  .322   Need (Maslow's need theory)[8] - A psychological or physiological requirement.

    .3221   Physiological Needs - Body function demands.

    .3222   Safety - Freedom from physical harm.

    .3223   Security - Assurance that physical needs will be met into the forseeable future.

    .3224   Affiliation - Close relationships with others.

    .3225   Esteem - Perceived peer opinion and self-image of one's personal worth.

    .3226   Self-actualization - Fulfillment of potential development and accomplishment.

1.320   Motivation (Continued)

.323   Reward Potential (Valence Theory)[9] - Perceived

potential value of incentive (reward).

.3231   Perceived Value - Magnitude of benefit

if reward is received.

.3232   Likelihood of Qualifying.

.3233   Likelihood of Receipt After Qualifying.

2.000   The Small Group

Small groups have been defined variously as being 2 - 5
people up through 2 - 20 by writers on the subject.   The
limiting number in specific cases depends on the indi-
vidual people involved and the activity undertaken by
them.   The essential concept is that a network of
interpersonal relationships exists such that all members
are simultaneously influenced by the single activity
being conducted by the group members.

2.100   Processes and Roles

The functions in the small group analogous to an

individual's nervous system are the processes and

roles undertaken by its members.   These are the

structures and mechanisms by which the group

members interrelate, communicate, and influence

each other.

2.110   Roles in Group Discussions

Specific types of participation are necessary

for groups to exist and function.   These

2.110   <u>Roles in Group Discussions</u> (Continued)

behavior types are called roles.

.111   Task Oriented - Roles necessary to task

accomplishment.

.1111   Seeking Information or Opinion
.1112   Giving Information or Opinion
.1113   Clarifying
.1114   Summarizing
.1115 'Consensus Testing
.1116   Elaborating
.1117   Initiating

.112   Maintenance of Group - Roles to facilitate

group processes.

.1121   Encouraging
.1122   Gate Keeping - Directing conversational
          traffic
.1123   Harmonizing
.1124   Compromising
.1125   Standard Setting
.1126   Testing

2.120   <u>Types of Authority</u>

Power to influence other group members can be

attributed to these basic types of authority.

.121   Physical Intimidation

.122   Legal Status

.123   Organizational Position

.124   Control of Information

.125   Knowledge of Subject

.126   Personality Characteristics

2.130   <u>Exchanges Between Members</u>

The processes, conventions, and structure of

interrelationships among group members engaged

in sharing information prescribe their exchanges.

2.130   <u>Exchanges Between Members</u> (Continued)

    .131   Transactional Analysis Theory (Harris)[10]

    .132   Social Exchange Theory (Blau)[11]

    .133   Interaction Process Analysis (Bales)[12]

    .134   Field Theory (Lewin)[13]

    .135   Social System Theory (Homans)[14]

2.200   <u>Information Processing</u>

A grouping of individuals becomes a group through
mutual participation in information processing.
The human characteristics of a small group are
developed and studied in terms of information
being transferred among its members and their
reactions in the process.

2.210   <u>Network Design</u>

The configuration of the communications
linkages within the group.

    .211   Linear - Members in a line.

    .212   Circular - Members in a circle.

    .213   Wheel - Members in circle with one in center.

    .214   Star - All talk to one in middle only.

    .215   Honeycomb - Members in rows and columns.

    .216   Hierarchical - One superior and several
          subordinates.

    .217   Multiconnection - All talk to all others.

2.220   <u>Decision Making</u>

    .221   Authoritarian or Autocratic

    .222   Black Ball

2.220   Decision Making (Continued)

.223   Majority Rule

.224   Consensus

2.230   Creative Thinking

.231   Brainstorming - An open "free think" idea
generating session where all spontaneous
ideas are recorded with critical analysis
reserved for a later time.

.232   Delphi Technique - An estimative or
predictive process where individual anonymous
expert opinions are pooled in a forced
consensus through iterative modifications
based on relative position feedback.

2.300   Attitudinal Disposition (Esprit de Corps)

The term "esprit de corps" pertains to the group
outlook, attitude, and mood just as morale does
in the case of the individual. Group esprit de
corps is a function, in part, of the extent to
which individual group members perceive their
own needs being met by group affiliation and
participation. It results from the complex
interrelationships and exchanges, at several
levels of abstraction, among group members.

3.000   The Large Group

Gatherings and organizations too large to fall into the
previous category, but smaller than a society, in toto,

belong here. Large groups are made up of many over-lapping and intermeshing small groups, formal and informal, which are related or become mutually identified by a common structure of interest and communication.

3.100 <u>Organizational Theory</u>

The mechanisms by which large groups function are developed and understood primarily in terms of the leader's roles and activities, and assumptions about people that underlie various behavioral norms in leader/subordinate relationships.

3.110 <u>Leadership</u>

.111 Traits

.1111 Intelligence
.1112 Self-confidence
.1113 Initiative
.1114 Self-knowledge
.1115 Integrity
.1116 Responsibility
.1117 Courage
.1118 Decisiveness
.1119 Personality Characteristics

.112 Styles

.1121 Authoritarian or Autocratic
.1122 Democratic
.1123 Consensus Seeking

.113 Orientation

.1131 Task
   311 Time and motion study
   312 Process design
.1132 Organization
   321 Span of control
   322 Functional configuration
   323 Product system configuration
.1133 Human Relations
   331 Job enrichment
   332 Team building
   333 Management by objectives
   334 Participative management

3.110 Leadership (Continued)

.114 Skills

.1141 Planning
.1142 Staffing
.1143 Organizing
.1144 Coordinating
.1145 Directing
.1146 Controlling
.1147 Motivating

3.120 Assumptions About People

.121 Theory X - Theory Y (McGregor)[15]

.122 Scheim's Four Assumptions (Scheim)[16]

.123 System 1 through System 4 (Likert)[17]

.124 Maturity - Immaturity Theory (Argyis)[18]

.125 Life Cycle Theory (Hersey and Blanchard)[19]

3.200 Information Processing

Without information exchange among individuals and included small groups, the large group would not exist. The "Infostructure"[20] includes all formal and informal channels for information to be moved within the large group including interfaces to the outside world.

3.210 Formal Channels

Communications channels that are design features of the organization comprise the formal info-structure.

.211 Direction of Communication

.2111 Vertical
.2112 Lateral

.212 Mode

.2121 Letter

3.212 Formal Channels, Mode (Continued)

.2122 Newspaper
.2123 Regulations and Manuals
.2124 Audio Tapes
.2125 Video Tapes
.2126 Meeting

.213 Purpose

.2131 Inform
.2132 Direct
.2133 Coordinate

3.220 Informal Channels

.221 Grape Vine

.222 Ideas in Good Currency (Schon)[21] - The social version of "attending" as various subjects become popular topics for conversations.

.223 Social Concept of Reality (Berger & Luckman)[22] The social process of internalizing a view of what constitutes the real world.

3.300 Attitudinal Disposition (Esprit de Corps)

Large group esprit de corps is an extension of the concepts discussed for the small group (2.300).

1. The term "Esprit de Corps" was selected by the author as a descriptor for this category. Two committee members, however, felt the term was too limiting and too jargonistic. Alternative suggestions were "Disposition" and "Group Disposition."

2. Bernard M. Bass, James A. Vaughan, _Training In Industry: The Management of Learning_ (Belmont, California: Wadsworth Publishing Co., Inc., 1969), p. 7.

3. John R. Anderson, Gordon H. Bower, _Human Associative Memory_ (Washington, D.C.: Hemisphere Publishing Corporation, 1974), 517 pp.

4. Ibid., p. 42.

5. Ibid., p. 58.

6. Ibid.

7. Ibid., p. 46.

8. Abraham H. Maslow, _Motivation and Personality_ (New York: Harper and Row Publishers, 1954).

9. Edward E. Lawler, _Pay and Organizational Effectiveness: A Psychological View_ (New York: McGraw-Hill, 1971), pp. 79-99. _From Readings For General Psychology (PL 202 and PL 252)_, (Lexington, Massachusetts: Xerox College Publishing), p. 54.

10. Thomas A. Harris, M.D., _I'm OK - You're OK_ (New York: Avon Books, 1973), 304 pp.

11. Peter M. Blau, _Exchange and Power in Social Life_ (New York: John Wiley and Sons, Inc., 1967), 352 pp.

12. Robert F. Bales, _Interaction Process Analysis_ (Cambridge, Massachusetts: Addison-Wesley Press, Inc., 1950), 200 pp.

13. Clovis R. Sheperd, _Small Groups - Some Sociological Perspectives_ (Scranton, Pennsylvania: Chandler Publishing Company, 1964), p. 23.

14. George Caspar Homans, _Social Behavior - Its Elementary Forms_ (New York: Harcourt, Brace & World, Inc., 1961), 398 pp.

15. Paul Hersey, Kenneth H. Blanchard, _Management of Organizational Behavior_ (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972), p. 46.

16. Ibid., p. 166.

17. Ibid., p. 60.

18. Ibid., p. 50.

19. Ibid., p. 174.

20. The term "infostructure" was coined by this author in an unpublished paper at the University of Southern California, Sacramento Campus, 1975.

21. Donald A. Schon, _Beyond the Stable State_ (New York: W.W. Norton & Company, Inc., 1971), 254 pp.

22. Peter L. Berger, Thomas Luckman, _The Social Construction of Reality_ (New York: Doubleday & Co., Inc., 1967), 208 pp.

CHAPTER VI

CONCLUSIONS

Application to the Military

There are two practical applications of this
taxonomy in the military, one personal and one insti-
tutional. First, officers or NCOs who wish to develop
or better understand the relationship between the leader
and the led can use this taxonomy as a guide to study
human factors. This structure facilitates selection of
reading material, minimizes unnecessary overlap and
insures adequate coverage. It also provides the frame-
work to correlate new knowledge of human factors, while
aiding comprehension and retention.

Second, the primary use for this taxonomy in
the military will probably be institutional. A need
for research by service sponsored activities, e.g.,
Army Research Institute (ARI) and the RAND Corporation
is indicated in the conclusions derived from this
taxonomy.

The design of courses of study will be facilitat-
ed and enhanced by reference to this taxonomy. A separate
course on human factors, for example, could use portions
of the taxonomy as an outline. In a more general course

on human resource development such as USACGSC Course
number 9570, Personnel Management - Human Resource
Development, topics in human factors are interspersed
with discussions of activities and skills in counselling,
management, and leadership. In this case the taxonomy
would be useful to outline segments of the course, and to
position them in context within the larger subject area
of human factors.

Course 9570 has three seminar periods specifically
designed to address human factors, including motivation
and small group behavior. While several theories of
motivation are discussed in the class, there is nothing
in the course material to establish motivation as an
element of morale along with stress, anxiety, and
frustration. Neither is there a discussion of the
dimensions of motivation as a whole topic as opposed to
examination of some representative theories. A more
complete treatment of the subject could be developed
with no more presentation time required if a structure
like that in the taxonomy were adopted for the material
in the human factors portion of the course.

Conclusions

This taxonomy is clearly not exhaustive, but does
provide a framework for additional relevant material.
Also, two important implications can be drawn from this
study.

First, the structure of the taxonomy clearly
demonstrates that human factors are a result of continuing
information processing. This is much more specific than
the generally cited concept that we are products of our
environment. "Experience" in the environment is a broad,
general concept that fails to describe a specific process.
It relies instead on an intuitive understanding of what
such experience entails. Reference to the acquisition
and storage of information, along with the mental habit
patterns that result, focuses in a descriptive way on
the processes that determine human factors.

Second, there is a conspicuous absence of
theoretical development in the literature of a group
equivalent to morale. Many indicators exist for assessing
the level of "morale" in an organization; AWOL and
reenlistment rates, awards and decorations, and
disciplinary action rates for example. Also, it is widely
accepted that esprit de corps in a unit can be favorably
influenced by a challenging mission, firm and fair
discipline, and clear communications channels. Know-
ledge of these effects, however, does not explain the
phenomenon itself.

One possible view is that esprit de corps is
simply the sum, or average, of the morale of all group
members individually. This idea is, in fact, reflected
in the practice of assessive indicators as mentioned
above. Such a concept, however, is clearly too simplistic.

Just as information processing at the individual and group levels are qualitatively different, esprit de corps is certainly a complex result of exchanges among group members at several levels of abstraction and with varying degrees of influence over each other.

The absence of material on the nature of esprit de corps in the theoretical literature would strongly suggest the need for original research and theoretical development of the concept. Since this is a phenomenon of well recognized importance in the military, it would be appropriate for service sponsorship of such studies through civilian defense contractors such as ARI or RAND Corporation activities.

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